

Application Serial No. 10/648,012
Response to Office Action of March 30, 2007
Attorney Docket No. W003-4000

AMENDMENT TO CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application. Six new claims, 54-59 have been added.

Listing of Claims:

Claims 1 - 18 (canceled).

19: (Currently Amended) A wireless digital audio system, comprising:
at least one audio source to produce an audio output representative of music;
at least one digital audio transmitter operatively coupled to said at least one audio source, said at least one audio transmitter comprising:
a first analog low pass filter receiving the audio output from said at least one audio source;
a digital low pass filter;
an analog-to-digital converter (ADC) operatively coupled between said first analog and digital low pass filters;
a first encoder receiving output from said digital low pass filter and being configured to reduce intersymbol interference (ISI);
a second channel encoder operatively coupled to said first encoder and adapted to reduce transmission errors;
a digital modulator operatively coupled to said second channel encoder;
and
a differential phase shift key (DPSK) module receiving output from said digital modulator and a unique user code bit sequence and being configured for direct sequence spread spectrum (DSSS) communication, said DPSK module transmitting a corresponding DSSS signal having said audio output representative of the music and the unique user code bit sequence;
at least one audio receiver configured for digital wireless communication with said at least one audio transmitter ~~and utilizing embedded fuzzy logic to optimize digital signal processing~~, said at least one audio receiver comprising:

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a band pass filter (BPF) configured to process said transmitted DSSS signal;

a direct conversion module receiving output from said BPF and being configured to capture the ~~correct~~ unique user code bit sequence embedded in said processed DSSS signal;

a digital demodulator adapted to process an output from said direct conversion module;

a Viterbi decoder operatively coupled to said digital demodulator and generating a corresponding digital output;

a source decoder processing said digital output from said Viterbi decoder and being configured to decode the digital signal encoded by said first encoder;

a second analog low pass filter; and

a digital-to-analog converter (DAC) operatively coupled between said source decoder and said second analog low pass filter, said second analog low pass filter generating ~~an~~ the audio output representative of the music corresponding to the decoded and converted digital signal; and

at least one module adapted to reproduce said ~~generated~~ audio output representative of said music, if the unique user code bit sequence is recognized, said audio output having been wirelessly transmitted from said at least one audio source to a user for private audio reproduction of said music without interference from other users or wireless devices.

20. (Previously Presented) The wireless digital audio system of Claim 19, wherein said BPF is a wideband BPF.

21. (Previously Presented) The wireless digital audio system of Claim 19, wherein said modulator is a 64-Ary modulator.

22. (Previously Presented) The wireless digital audio system of Claim 19,

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wherein said demodulator is a 64-Ary demodulator.

23. (Previously Presented) The wireless digital audio system of Claim 19, wherein said generated audio output is in the approximate range of 20 Hz to 20 kHz.

24. (Previously Presented) The wireless digital audio system of Claim 19, wherein said spread spectrum signal is transmitted at about 2.4 GHz via an omnidirectional antenna.

25. (Previously Presented) The wireless digital audio system of Claim 24, wherein said spread spectrum signal is transmitted at a power of about 100 milliwatts or less.

26. (Previously Presented) The wireless digital audio system of Claim 19, wherein said ADC is a 4-bit analog-to-digital converter.

27. (Previously Presented) The wireless digital audio system of Claim 19, wherein said at least one audio source is a portable audio player.

28. (Previously Presented) The wireless digital audio system of Claim 19, wherein said at least one audio reproducing module includes at least one headphone speaker.

29. (Previously Presented) The wireless digital audio system of Claim 19, wherein said BPF is operatively coupled to at least one antenna configured to receive said transmitted DSSS signal.

30. (Currently Amended) A wireless digital audio system, comprising:
at least one audio source;

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at least one digital audio transmitter operatively coupled to said at least one audio source, said at least one audio transmitter comprising:

~~a first analog low pass filter receiving audio output from said at least one audio source;~~

a digital low pass filter;

an analog-to-digital converter (ADC) operatively coupled between said first analog and digital low pass filters;

a first encoder receiving output from said digital low pass filter and being configured to reduce intersymbol interference (ISI);

a second channel encoder operatively coupled to said first encoder and adapted to reduce transmission errors;

a digital modulator operatively coupled to said second channel encoder; and

a differential phase shift key (DPSK) module receiving output from said digital modulator and a unique user code and being configured for direct sequence spread spectrum (DSSS) communication, said DPSK module transmitting a corresponding DSSS signal;

at least one audio receiver configured for digital wireless communication with said at least one audio transmitter and utilizing embedded fuzzy logic ~~to optimize digital signal processing~~ to enhance detection of the unique user code in said transmitted DSSS signal, said at least one audio receiver comprising:

a band pass filter (BPF) configured to process said transmitted DSSS signal;

a direct conversion module receiving output from said BPF and being configured to capture the correct bit sequence embedded in said processed DSSS signal;

a digital demodulator adapted to process output from said direct conversion module;

a Viterbi decoder operatively coupled to said digital demodulator and generating a corresponding digital output;

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a source decoder processing said digital output from said Viterbi decoder and being configured to decode the digital signal encoded by said first encoder;

a second analog low pass filter; and

a digital-to-analog converter (DAC) operatively coupled between said source decoder and said second analog low pass filter, said second analog low pass filter generating ~~an~~ the audio output ~~corresponding to the decoded and converted digital signal;~~

at least one module adapted to amplify said generated audio output; and

at least one module adapted to reproduce said amplified audio output, if the unique user code is recognized, said audio output having been wirelessly transmitted from said at least one audio source to a user privately without interference from other users or wireless devices.

31. (Previously Presented) The wireless digital audio system of Claim 30, wherein said at least one audio amplifying module includes at least one power amplifier, said at least one power amplifier being configured to provide a low distortion audio signal output.

32. (Previously Presented) The wireless digital audio system of Claim 31, wherein said at least one audio reproducing module includes at least one headphone speaker, said at least one headphone speaker receiving said low distortion audio signal output from said at least one power amplifier.

33. (Previously Presented) A wireless digital audio system, comprising:

at least one audio source;

at least one digital audio transmitter operatively coupled to said at least one audio source;

at least one audio receiver adapted for digital wireless communication with said at least one audio transmitter, each of said at least one digital audio transmitter and

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receiver being configured for code division multiple access (CDMA) communication;
 and

at least one module adapted to audibly reproduce said processed CDMA signal,
 said CDMA communication configuration providing a user with independent audio
 reproduction free of interference from other users or wireless devices.

34. (Previously Presented) A wireless digital audio system, comprising:

at least one audio source;

at least one digital audio transmitter operatively coupled to said at least one
 audio source;

at least one audio receiver adapted for digital wireless communication with said
 at least one audio transmitter, each of said at least one digital audio transmitter and
 receiver being configured for code division multiple access (CDMA) communication;

at least one module adapted to amplify said processed CDMA signal; and

at least one module adapted to audibly reproduce said amplified signal, said
 CDMA communication configuration providing a user with independent audio
 reproduction free of interference from other users or wireless devices.

Claims 35 - 36 (canceled).

37. (Previously Presented) The wireless digital audio system of Claim 33,
 wherein said at least one audio source provides analog output in the approximate range
 of 20 Hz to 20 kHz.

38. (Previously Presented) The wireless digital audio system of Claim 34,
 wherein said at least one audio source provides analog output in the approximate range
 of 20 Hz to 20 kHz.

Claims 39 - 40 (canceled).

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41. (Previously Presented) The wireless digital audio system of Claim 33, wherein at least one of said digital audio transmitter and receiver is battery-powered.

42. (Previously Presented) The wireless digital audio system of Claim 34, wherein at least one of said digital audio transmitter and receiver is battery-powered.

43. (Currently Amended) A wireless digital audio system, comprising:
at least one audio source;
at least one digital audio transmitter operatively coupled to said at least one audio source, said at least one audio transmitter comprising:
a first analog low pass filter receiving audio output representative of music from said at least one audio source;
a digital low pass filter;
an analog-to-digital converter (ADC) operatively coupled between said first analog and digital low pass filters;
a first encoder receiving output from said digital low pass filter and being configured to reduce intersymbol interference (ISI);
a second channel encoder operatively coupled to said first encoder and adapted to reduce transmission errors;
a digital modulator operatively coupled to said second channel encoder;
and
a differential phase shift key (DPSK) module receiving output from said digital modulator and a unique user code bit sequence and being configured for direct sequence spread spectrum (DSSS) communication, said DPSK module transmitting a corresponding DSSS signal;
at least one audio receiver configured for digital wireless communication with said at least one audio transmitter, said at least one audio receiver comprising:
a band pass filter (BPF) configured to process said transmitted DSSS signal;

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a direct conversion module receiving output from said BPF and being configured to capture the ~~correct~~ the unique user code bit sequence embedded in said processed DSSS signal;

a digital demodulator adapted to process output from said direct conversion module;

a Viterbi decoder operatively coupled to said digital demodulator and generating a corresponding digital output;

a source decoder processing said digital output from said Viterbi decoder and being configured to decode the digital signal encoded by said first encoder;

a second analog low pass filter; and

a digital-to-analog converter (DAC) operatively coupled between said source decoder and said second analog low pass filter, said second analog low pass filter generating ~~an~~ the audio output representative of said music ~~corresponding to the decoded and converted digital signal;~~ and

at least one module adapted to reproduce said ~~generated~~ audio output, if the unique user code bit sequence is recognized, said audio output representative of said music having been wirelessly transmitted from said at least one audio source to a user privately without interference from other users or wireless devices.

44. (Currently Amended) A wireless digital audio system, comprising:

at least one audio source;

at least one digital audio transmitter operatively coupled to said at least one audio source, said at least one audio transmitter comprising:

a first analog low pass filter receiving audio output representative of music from said at least one audio source;

a digital low pass filter;

an analog-to-digital converter (ADC) operatively coupled between said first analog and digital low pass filters;

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a first encoder receiving output from said digital low pass filter and being configured to reduce intersymbol interference (ISI);

a second channel encoder operatively coupled to said first encoder and adapted to reduce transmission errors;

a digital modulator operatively coupled to said second channel encoder; and

a differential phase shift key (DPSK) module receiving output from said digital modulator and a unique user code and being configured for direct sequence spread spectrum (DSSS) communication, said DPSK module transmitting a corresponding DSSS signal;

at least one audio receiver configured for digital wireless communication with said at least one audio transmitter, said at least one audio receiver comprising:

a band pass filter (BPF) configured to process said transmitted DSSS signal;

a direct conversion module receiving output from said BPF and being configured to capture the ~~correct bit sequence~~ unique user code embedded in said processed DSSS signal;

a digital demodulator adapted to process output from said direct conversion module;

a Viterbi decoder operatively coupled to said digital demodulator and generating a corresponding digital output;

a source decoder processing said digital output from said Viterbi decoder and being configured to decode the digital signal encoded by said first encoder;

a second analog low pass filter; and

a digital-to-analog converter (DAC) operatively coupled between said source decoder and said second analog low pass filter, said second analog low pass filter generating an the audio output representative of the music ~~corresponding to the decoded and converted digital signal~~;

at least one module adapted to amplify said generated audio output; and

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at least one module adapted to reproduce said amplified audio output, if the unique user code is recognized, said audio output having been wirelessly transmitted from said at least one audio source to a user privately ~~without interference from other users or wireless devices.~~

45. (Previously Presented) The wireless digital audio system of Claim 43, wherein said at least one audio source provides analog output in the approximate range of 20 Hz to 20 kHz.

46. (Previously Presented) The wireless digital audio system of Claim 44, wherein said at least one audio source provides analog output in the approximate range of 20 Hz to 20 kHz.

47. (Previously Presented) The wireless digital audio system of Claim 43, wherein at least one of said digital audio transmitter and receiver is battery-powered.

48. (Previously Presented) The wireless digital audio system of Claim 44, wherein at least one of said digital audio transmitter and receiver is battery-powered.

49. (Previously Presented) The wireless digital audio system of Claim 43, wherein said at least one audio source is a portable music player.

50. (Previously Presented) The wireless digital audio system of Claim 44, wherein said at least one audio source is a portable music player.

51. (Currently Amended) A wireless digital audio transmitter, comprising:
a first analog low pass filter receiving audio output representative of music from at least one audio source;
a digital low pass filter;

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an analog-to-digital converter (ADC) operatively coupled between said first analog and digital low pass filters;

a first encoder receiving output from said digital low pass filter and being configured to reduce intersymbol interference (ISI);

a second channel encoder operatively coupled to said first encoder and adapted to reduce transmission errors;

a digital modulator operatively coupled to said second channel encoder;

a code generator to add a unique user code to a modulator output, the modulator output including the audio output representative of said music; and

a differential phase shift key (DPSK) module receiving the modulator output from said digital modulator and the unique user code and being configured for direct sequence spread spectrum (DSSS) communication, said DPSK module transmitting a corresponding DSSS signal.

52. (Currently Amended) A wireless digital audio receiver, comprising:

a band pass filter (BPF) configured to process a transmitted DSSS signal;

a direct conversion module receiving output from said BPF and being configured to capture ~~the correct~~ a unique user code bit sequence embedded in said processed DSSS signal;

a digital demodulator adapted to process output from said direct conversion module;

a Viterbi decoder operatively coupled to said digital demodulator and generating a corresponding digital output;

a source decoder receiving said digital output from said Viterbi decoder and being configured to decode the digital signal encoded therein;

a second analog low pass filter; and

a digital-to-analog converter (DAC) operatively coupled between said source decoder and said second analog low pass filter, said second analog low pass filter generating an audio output representative of music, if the unique user code bit

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sequence is recognized, corresponding to the decoded and converted digital signal, said audio output having been wirelessly transmitted to a user for private listening of high fidelity audio music without interference from other users or wireless devices.

53. (Currently Amended) A wireless digital audio receiver ~~utilizing embedded fuzzy logic to optimize digital signal processing~~, comprising:

- a band pass filter (BPF) configured to process a transmitted DSSS signal;
- a direct conversion module receiving output from said BPF and being configured to capture ~~the correct~~ a unique user code bit sequence embedded in said processed DSSS signal;

- a fuzzy logic detector to enhance detection of the unique user code bit sequence;

- a digital demodulator adapted to process output from said direct conversion module;

- a Viterbi decoder operatively coupled to said digital demodulator and generating a corresponding digital output;

- a source decoder receiving said digital output from said Viterbi decoder and being configured to decode the digital signal encoded therein;

- a second analog low pass filter; and

- a digital-to-analog converter (DAC) operatively coupled between said source decoder and said second analog low pass filter, said second analog low pass filter generating an audio output, if the unique user code bit sequence is recognized, corresponding to the decoded and converted digital signal, said audio output having been wirelessly transmitted to a user privately without interference from other users or wireless devices.

54. (New) A wireless digital audio system, comprising:

- an audio source to provide an audio signal representative of music having an existing analog headphone plug;

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a battery-powered transmitter coupled to said at least one audio source via said analog headphone plug and operative to transmit a code division multiple access (CDMA) communication signal having said audio signal representative of said music and an added unique user code;

a battery-powered audio receiver headphone set operative to receive the CDMA communication signal and audibly reproduce said audio signal representative of said music, if the unique user code is recognized, to provide a particular user with private audio reproduction free of interference from other users of other wireless digital audio music systems in a shared space.

55. (New) A wireless digital audio system, comprising:

an audio source to provide an audio signal representative of music having an existing analog headphone plug;

a battery-powered transmitter coupled to said at least one audio source via said analog headphone plug and operative to transmit a code division multiple access (CDMA) communication signal having a differential phase shift keying (DPSK) modulated signal of said audio signal representative of said music and an added unique user code;

an audio receiver headphone set operative to receive the CDMA communication signal and audibly reproduce said audio signal, if the unique user code is recognized, to provide a user with private audio reproduction of said music free of interference from other users of other wireless digital audio music systems in a shared space.

56.(New) The system of claim 55, said audio receiver headphone further comprising a fuzzy logic detector to enhance detection of the unique user code.

57. (New) A wireless digital audio headset receiver, comprising:

a direct conversion module configured to receive a wirelessly transmitted code division multiple access (CDMA) signal having an audio signal representative of audio

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music and a unique user code; and

headset speakers for privately reproducing said audio music to a user, if the unique user code is recognized, and free of interference from other users of other wireless digital audio music systems in a shared space.

58.(New) The receiver of claim 57, further comprising a fuzzy logic detector to enhance detection of the unique user code.

59. (New) A code division multiple access (CDMA) battery-powered transmitter comprising:

a jack to connect to an existing analog headphone plug of an audio source;

means for receiving an audio output representative of music from the audio music source;

means for generating a unique user code; and

means for wirelessly transmitting a CDMA communication signal having said audio output representative of said music and said unique user code to a wireless headphone receiver.